Mortality of Philadelphia.

Number of deaths during	1860,	11,568,	of which	9	were from syphilis.
" " "	1861,	14.468,	"	9	" "
" " "	1862,	15.097,	"	21	" "
" " "	1863,	15,788,	"	28	" "
" " "	1864,	17,582,	"	25	" "
" " "	1865,	17,169,	"	30	" "
" " "	1866,	16,803,	"	22	" "
" " "	1867,	13,933,	"	25	" "
" " "	1868,	14,693,	"	43	" "
" " "	1869,	14,786,	"	21	" "
" " "	1870,	16,750,	"	23	" "
" " "	1871,	16,993,	"	19	" "

Unless these figures are incorrect, and I do not think they are so to any great extent, it is apparent that syphilis cannot be ranked as one of the *fatal* diseases, although it may be the cause of death in many instances.

From what has been written, the following conclusions may, I think, be reasonably arrived at:—

1st. That syphilis is a self-limited disease, and the patient, if blessed with a sound constitution, will, in the average of cases, get well, even if left untreated; but this course exposes to great and serious risk.

2d. That some general idea may be formed as to the future from the character of the earlier lesions; *this rule, however, is not absolute, as some cases do occur where the early stages are slight and the subsequent ones severe.* They are, nevertheless, I think, exceptional.

3d. That as the disease progresses, the prognosis is less favorable, more especially where important organs are attacked, such as those of the nervous or arterial systems; and,

4th. That in forming an opinion, due regard must be given to the age and general health of the patient, and in the treatment, attention must be paid, besides the proper use of specific remedies, to strengthening the patient, if debilitated from any cause whatsoever.

16 WEST 32D ST., NEW YORK.

ART. V.—*Cases Illustrative of the Use of the Ophthalmoscope in the Diagnosis of Intra-cranial Lesions.* By S. WEIR MITCHELL, M.D., Member of the National Academy of Sciences, and WM. THOMSON, M.D., Surgeon to Wills Ophthalmic Hospital, Philadelphia. (With a Woodcut.)

CASE 1.—Sept. 28, 1872, Dr. Wm. V. Keating was consulted by John M., æt. 20. Well developed physically; previously enjoyed excellent health, excepting occasional attacks of intermittent fever; has been for a year past acting as clerk, employed from 9 A.M. to 6 P.M.; has been considerably annoyed during the past summer from constant exposure to the effluvia of a water-closet adjacent to his desk. He enjoyed perfect health until six weeks ago, when he was seized with uncomfortable feelings in his head, especially about the nape of the neck; a roaring sound in his ears. He designated these sensations as "apoplectic feelings in the head." The pain was paroxysmal in character, and at times very acute, sometimes producing nausea and vomiting; constant insomnia; had at times a slight *wavy* feeling in walking; bowels had been regular; urine healthy; appetite normal; no tendency to erections; never had any specific taint; never received any serious injury on the head. Had been recommended in New York to try saline purges two or three times a week, and take bromide of potassium. The affection had been considered as due to his peculiar age and hyperæmic condition of the brain. Finding no amelioration he came on to Philadelphia. In walking the streets he accidently discovered that he had diplopia. The pulse ranged at that time 50 in the horizontal position, 110 in the erect; heart action regular, but weak; respiration 15; temperature 98°; slight ptosis of the left lid; some vertigo when suddenly assuming erect position; is always more comfortable lying down; position of head as to body inclining to opisthotonos; has an anxious, dull expression of face, with slight convergence of left eye. The above symptoms continued without much variation. On the 6th Oct. found him in bed, having suffered agonizing pain the previous night and vomited large quantities of bile; vertigo and increase of "apoplectic feelings" forced him to keep his bed. An ophthalmoscopic examination was made by Dr. Dyer, with the following results:—

> There was homonomous diplopia; separated images at eighteen feet brought together with prism of 25°; the external recti were not paralyzed entirely, for either eye could be turned outward by an effort; slight ptosis of left lid; pupils dilated and sluggish; vision = 1 (perfect); no myopia or hypermetropia. On examination with the ophthalmoscope a typical case of "choked disk" presented itself on both sides. The optic nerve was swollen, and careful measurement showed that it projected into the eye .68 millimetre; the eye being emmetropic, the apex of the papilla was best defined with $+ \frac{1}{16}$.
>
> The general number and course of the retinal vessels were normal. The arteries were rather small, and throughout their length presented the appearance of breaks in the continuity of the columns of blood, for a short stretch the vessel looking as if empty, followed by a stretch which was normally filled, then an empty portion, and so on to the end. The veins presented the same alternating stretches, but in a more marked degree, the contrast between the apparently filled and empty portions being more striking. The veins were tortuous and somewhat dilated, and pressure on the eye did not alter these appearances; the fundus was otherwise normal.

Treatment seemed to have no effect; at times would seem quite comfortable, with very little pain in the head, but always preferring a recumbent position. On 13th, Dr. Mitchell was called in consultation; proceeded to push the iodide-of-potassium treatment. Pulse now ranged 48 in recumbent position; 120 in the erect; temperature 98°.

16th. Has had more nausea and vomiting, and suffers from violent pain in the head and constant insomnia. Decided to give small doses of calomel and endeavour to produce ptyalism; opium suppositories at night.

18th. Calomel allayed nausea and vomiting, has had refreshing sleeps. Both papillæ more prominent, the anterior walls of the vessels being seen with $+ \frac{1}{16}$, showing an elevation from the fundus of 1 millimetre.

Between the 24th of October and the date of death, Dr. Mitchell examined the fundus of each eye repeatedly. The disks and vessels remained unchanged, but the acuity of vision certainly declined below the normal.

Passed a restless night; violent pain in the head; pulse in the recumbent position 120; great heat of skin; some numbness in the left side; temperature A.M. 100°, P.M. 101°; bowels costive; heavy deposit of urates.

22*d*. Symptoms have ameliorated; pain in the head less; pulse down to 50 in recumbent position; no impairment of intellect; no paralysis of motion or sensation. From that date to the 2d of November there was so much improvement in general symptoms as to afford hope that the disease was yielding to ptyalism.

Nov. 4th. Ptyalism complete; all the symptoms better, save the diplopia and ptosis, which have never abated.

6*th*. Patient worse; has a well-defined numbness over left side; skin hot; pulse 120 in recumbent position; temperature 101°; seems very despondent, and has all his apoplectic feelings increased, with violent pain in the head and constant vomiting.

10*th*. Much better; slept well; temperature 98°; pulse 76 in recumbent position; whenever he rises, has a wavy feeling in his head, and his gait is uncertain.

19*th*. Passed a very bad night; vomiting all night; agonizing pain in the head; face much flushed; temperature 98½°; pulse 50; anxious expression of face; convergence of eye much increased.

25*th*. Symptoms unchanged; had a well-defined numbness over left side that morning, which continued for fifteen minutes. About 6 P.M. sat up in bed to take some nourishment; asked to have his head put beneath the pillow; turned on his side, and suddenly died with symptoms of syncope. Urine constantly examined, and never gave any indications of albumen.

The chief and permanent symptoms through the case were violent pain in the head; roaring in the ears; occasional nausea and vomiting; diplopia; ptosis of left eye, with strabismus; uncertain gait, and wavy feelings in erect position, with slight opisthotonos; pulse ranging 50 when recumbent to 110 when erect. Bromide of potassium *invariably* from the commencement of the attack when taken increased what he called his apoplectic feelings.

Autopsy.—Body not emaciated. On opening the skull the basilar membranes were found seriously altered, apparently by simple inflammation, being opaque and irregularly thickened, especially about the middle line and directly in front of the pons. The membranes covering the cerebellum were rather thickly dotted on the left side with inflammatory deposits. On the right there were but two such spots, and on both sides these were near to the central fissure.

Between the upper surface of the cerebellum and the dura mater (whence it grew by a pedicle about four lines wide) lay a tumour which had totally obliterated the convolutions of the cerebellum below it, and had indented the organ so as to leave in it a depression one-fourth inch deep even after the tumour had been removed. This tumour was 2½ inches long and 1½ wide and 1½ thick. The surface of the cerebellum on which the mass rested was slightly softened and its membranes inflamed and thickened, while several loose bands of lymph connected them on both sides at the anterior portion of the cerebellum with the cerebral coverings. The interior of the brain was not otherwise altered, and the larger vessels were not diseased. The ventricles were considerably distended by clear serum.

Remarks.—The basal inflammation accounts, as I think, for the lesion of the second and sixth nerves. The downward cerebellar pressure could not, because it would have been too much distributed, or must have affected other nerves more gravely. It could not have so palsied the sixth without more than merely just disturbing others as it did the eighth. The death may have been due to sudden shifting of the mass backwards so as *suddenly* to compress the bulb, but *sudden* death without new lesion is common enough in cerebellar and other brain tumours.

The vomiting, the occipital pain, the disturbance of ocular motion, and finally of vision, with general feebleness without emaciation, and the vertigo, are all symptoms found in cerebellar tumours. The locomotion defects were not marked, and it is curious that with so much serum with meningitis there should have been no mental disturbance.

Amaurosis is commonly mentioned as one symptom of cerebellar tumours, but it occurs also in other tumours (intra-cranial), and may be often due, as was the lessened acuity of vision here, to swollen disks, lasting so long as to compress and injure the nerve fibres in their passage.

The case presented no symptoms related to the generative organs.

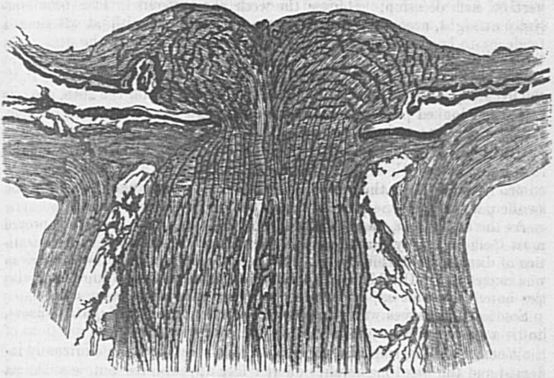
Microscopical Examination, by Dr. Thomson.—A portion of the posterior part of each eyeball, containing the papilla, together with the optic-nerve as far back as the apex of the orbit, was removed; and on inspection a swelling 5 mm. in diameter, and 1 mm. high was observed at the intra-ocular extremity of each nerve. The central vessels of the retina were indistinctly seen until they reached the margin of the swelling where they presented their usual appearance. These specimens were immediately placed in Müller's fluid, together with a portion of the tumour, which proved to be a small-celled sarcoma.

When one of the specimens had been sufficiently hardened, horizontal and transverse sections were made, one of which through the centre of the papilla, stained with hæmatoxylon and mounted in balsam, is represented in the wood-cut, enlarged about 15 diameters. The diameter of this disk at the choroid is 1½ mm., and the apex of the swelling rises 1½ mm. above it, whilst the extent of the engorgement on either side into the retina amounts to 6 mm. transversely. Behind the cribriform fascia the nerve suddenly expands to 3 mm. in diameter.

With a low power the swollen portion of the papilla is found to consist largely of bloodvessels so distended with red corpuscles as to resemble an injected specimen. Upon tinting with carmine little or no differentiation of tissue is observed, but upon the use of logwood the older or formed parts, as for example the sheath of the nerve, the sclera, and the nerve fibres, assume a lavender hue, whilst the granular layer of the retina, and the nuclei of the coats of the bloodvessels, and of the entire connective tissue are stained a deep purple. The course of each capillary vessel becomes apparent by the stained nuclei in its walls, and it is at once evident to the observer that the vascular supply of this disk is pathological, and that the enormously multiplied vessels contribute largely to the swollen condition of the papilla.

On teasing out a portion undoubtedly pathological, and using for its examination a No. 9 immersion system of Hartnack, one finds the axis cylinders and the processes of the neuroglia undistinguishable and tinted alike of a lavender hue, while the nuclei of the neuroglia, oblong, oval, and round in shape, and of varying size, are recognized by their deep purple color. No degeneration of the axis cylinders could be found. No change further than those above described was observed.

On a comparison of the sections of this nerve with those tinted and treated in the same manner and believed to be normal, it is evident that the purple nuclei are infinitely more abundant in the one than the other, not only in the swollen intra-ocular end of the nerve, but at the cribriform fascia, and throughout the entire nerve-trunk behind it, as far as it was examined. In the accompanying wood-cut an effort has been made to designate the lines formed by the tinted nuclei that lie thickly strewn in the interfascicular spaces of nerve-bands as they pass through the cribriform fascia, where they are so abundant that they give a purple hue to the entire field as observed with a low power. Whether these tinted parts are emigrant cells undergoing development, or the result of a proliferation of the neuroglia proper of the nerve, involves the whole mooted question of inflammation, and must remain undecided for the present, but it would seem evident that this entire nerve has undergone a pathological change, and that it is at present in the condition of vascular engorgement and hyperplasia of its connective tissue.



Magnified 15 diameters.

The sheath of the nerve and the inter-vaginal space appear normal, and the changes in structure seem confined to the nerve itself.

CASE 2.—M. C., female, æt. 21, of a healthy family, was a vigorous person but subject to severe headaches, especially just before her periods. For a year previous to her death she had occasional double vision. October 7, 1872, she had an attack of sore throat, with aches in all the limbs and in the back and head. Little was thought of this as she had taken excessive exercise the day before, and as she became unwell on the 8th: on the 10th, her headache in place of lessening was worse, and her friends noted that her eyes squinted slightly at times and looked dull and lifeless. Meanwhile, on the 11th and 12th, the cephalalgia and sense of vertical pressure on the head were described by her as unendurable. She was still about, but would sit upright with the eyes fixed. She said any movement hurt her and that the eyes especially were pained by motion. On the 14th, a hypodermic injection of morphia was given with present relief of pain but after-effects in the way of nausea and a sense of increased pressure on the brain. Up to this time and indeed until near the end of her illness, it was regarded as neuralgic and was treated chiefly by quinia and morphia. On the 14th, the filling of a tooth which proved sore from an abscess in the fang was removed without relief. She was thenceforward kept more comfortable by hypodermic injections twice a day; not over ¼ grain being used on each occasion. During the week she suffered intense pain especially at night, accompanied with more or less fever, with at all times a tendency to keep the head thrown back by a pillow under the neck. On 19th October, she felt better, but spoke still of the horrible sense of weight on the head, and up to this time there had been no delirium. At 10 P.M. the usual injection of ¼ grain was given. At 8 A.M. on the 20th, she was asleep but looked pale and breathed heavily and was sweating profusely. At 10, she seems to have had a slight spasm. At 12, she became slightly unconscious but recognized some of those about her. Her power to swallow was thenceforth impaired and she passed into a state of profound coma. On the 21st, the neck behind the ear became remarkably red and swollen, and on the morning of the 22d October she died quietly.

As the death took place in Europe the body was embalmed, as it proved most inefficiently, by throwing into the stomach and rectum large quantities of dissolved chloride of zinc. Six weeks after death Dr. W. W. Keen was requested by Dr. Mitchell to make an examination of the head with the hope that some explanation of the symptoms would be found.

Some of the tissues were decomposed and the brain itself quite diffluent, but it was still plain enough that all the upper and anterior portions of the membranes covering the cerebral hemispheres had been intensely inflamed and the basal membranes offered like appearances but less distinct in character. The brain changes were of course undistinguishable. From the lower anterior edge of the right parietal bone projected an exostosis ¼ inch thick, an inch long, and half as wide. As many as forty other exostoses, all of them small (1 or 2 lines wide by 1 to 3 long) grew from the various cranial bones on the arch and sides but not on the base, while the sides of the longitudinal sinus were plated by long flat irregular masses of bone which passed ¼ inch downward into the great fissure below the sinus. These, of course, grew from the dura-mater. Some of the soft parts about the head were greatly altered, others were wonderfully preserved. Thus on carefully removing the back of the eyes I found that the optic disk projected clearly and distinctly above the retina. It was quite firm and hard, and there must have been not only œdema and congestion but such proliferation of its connective tissues as to leave it thus enlarged and prominent despite the changes I have described.

The above I have ventured to add to this collection of cases of brain tumour because of its rare interest. It was regarded by those in attendance as a case of congestion of the base of the brain, but it proved to be an example of exostoses which must have been the growth of years, and which during times of congestion were more and more severely felt by the brain on the limits of which they intruded. At length, a sharp influenza occurring at a menstrual period proved sufficient to raise this occasional irritation to the grade of inflammation. I was amazed to find the right disk (the only one examined) as I described it.

Remarks.—A high degree of very painful uncertainty as to the cause of the death of this lady remained in the minds of her friends, and was dissipated only by the post-mortem examination made so long after her decease.

The examination of the fundus by the ophthalmoscope in her last illness would have given an early warning of her danger, and would have prevented the suspicion that death had followed upon the use of therapeutic agents. Indeed, it is not improbable that, months previous to her death, when she first complained of diplopia, an examination would have revealed the condition of choked disk and given the note of alarm to herself and her friends.

CASE 3.—Dr. Mitchell was asked by Dr. Hamilton in May, 1872, to see Mary C——, æt. 16 years. Dr. H. had attended her through a recent attack of typhoid fever, which presented the unusual symptom of more or less steady pain in the head throughout the attack. She was convalescent and afoot about three weeks, when she began to complain of a frontal headache, and at times of rheumatism in the back of the neck. Recently the headache had increased, and she complained of noise like falling water in the right ear; found her lying in bed, flushed and feverish; pulse 110; respiration 30, and interrupted at brief intervals. The fever was worse at night, and she had had for three days nausea, at intervals; the scalp over the right eye was œdematous, and elsewhere was sore; sudden movements increased her pain notably; the chest presented evidence of slight bronchitis, but there were no cardiac lesions; the right eye had drooped a little, and there was, at times, double vision, with loss of power over the right internal rectus, and the pupil was a little dilated and sluggish. The left eye-ground was nearly normal, with, perhaps, too much colour in the disk, as compared with the right, which was somewhat swollen, so that the summit was seen clearly with + 16 of Loring's ophthalmoscope. It was grayish and hazy, and the vessels leaving the disk looked as if covered with ground glass. There were no hemorrhages, old or recent, and the remainder of the eye-ground was, perhaps, less red than that of the left eye. On the third day after, the headache was intense; pulse 120; breathing broken, and the fever high. Two days later the eyes were unaltered, save that the muscles controlled by the third nerve were totally palsied on the right side, and partially on the left; the acuity of vision was not much impaired. The disks presented the same appearances ten days later, just before death.

On the fifth day her deglutition became impaired and the delirium, which was previously rare, increased by degrees, while the headache, flush, and fever grew worse; no other notable changes took place; but there was simply a slow increase in the gravity of all the symptoms, until at the seventeenth day she could not swallow at all; the constipation became obstinate; coma set in, and she died on the twenty-first day.

The diagnosis was sufficiently clear as to the presence of meningitis. I belived also that there was a tumour, and that it was probably near the base of the brain. Its nature was made more clear by the family history which Dr. Hamilton thus detailed:—

I. M. C. her father died of "chronic cough," æt. 61; his wife of consumption, æt. 52.

Their sons, W. C., died æt. 30, of consumption; P. C., with symptoms of meningitis, æt. 23.

Mrs. M. C. F. died of phthisis, æt. 34; I. M. C., æt. 46, of abscess of the lung and paralysis.

Eliz. C., daughter of the above named, W. C., died æt. 18 of phthisis.

Mary C., her sister, was our patient; there are still alive three other children; one is healthy, one is hysterical and feeble, one is tubercular, and this history left little doubt as to the presence of tubercle in this case.

Autopsy.—The body not wasted; the brain healthy, except at the base, where the membranes were matted togetter, and thickened by tubercular meningitis. One large mass, the size of a walnut, was imbedded in the anterior and lower part of the posterior cerebral lobe. So coarse was the lesion that I wondered how the other nerves than the third could have escaped; yet the fourth and sixth were not affected in any marked degree. The optic disk of the right eye was removed and preserved for examination. It was distinctly swollen. The details of its microscopic study will be found below.

Remarks.—The diagnosis of meningitis in this case was easy; that of tumour was less reliable, although it also proved to be correct. I was struck, at my first visit, with the curious odour of the breath, which is nearly always peculiar in cases of meningitis, and I find it alluded to in many of my notes of cases of cerebral disease.

Microscopical Examination of Optic Disk.—One inch and a quarter of the optic nerve with portions of the tunics of the ball surrounding the disk were placed in Müller's fluid, hardened and cut transversely and horizontally. In the removal of the specimen, the retina was so lacerated as to render an accurate description of the dimensions of the swelling impossible, but its apex is one mm. in front of the cribriform fascia.

It is well known that tinting with carmine is unsatisfactory after the hardening has been effected by chromic acid, and the sections when stained with carmine gave little evidence of any pathological condition; but upon the use of hæmatoxylon it became evident that the nuclei of the neuroglia were infinitely more abundant than in normal nerve, and it seems evident that this entire nerve has undergone a hyperplasia of its connective tissue.

CASE 4.—In the *Philadelphia Medical Times*, Nov. 16, 1872, will be found the report of a "Fatal Case of Purulent Aural Catarrh," by Dr. Harlan, which becomes of interest in this connection, since the diagnosis of intra-cranial inflammation was rendered more certain by the use of the ophthalmoscope. Dr. Thomson saw this patient a few days before death, and assisted at the autopsy, and can confirm Dr. Harlan's description of the condition of the disks in every respect; they were both much swollen, with obscured margins; their arteries were contracted and veins engorged. The rest of the fundus was normal, and its refraction, as determined by the ophthalmoscope, emmetropic, whilst the highest point of the swollen disk could be seen with a $+\frac{1}{8}$, indicating a swelling of this part above the fundus of 1.5 mm. The acuity of vision was not accurately determined, but she was able to read small type fluently.

After death, an abscess containing an ounce of pus was found in the middle lobe of the left side of cerebrum; the petrous portion of the temporal bone was found carious, and covered with a thick deposit of lymph, and the membranes of the brain were extensively engorged on that side. It was found impossible to obtain the disks, but the optic commissure was placed in Müller's fluid, hardened, cut into thin sections, stained with logwood, and mounted in balsam. In comparing these specimens with those taken from the optic commissure of a man who died from a traumatic cause, and similarly treated, it seems evident that the bloodvessels are more numerous, and in any given field of the microscope, the stained nuclei much more thickly strewn through the tissue of the one than the other. There is no abnormal appearance in the intra-vaginal space, nor do the nerve fibres appear to have undergone any change.

CASE 5.—D. L., clerk, æt. 31, several years ago was intemperate and 18 years back had chancre and subsequent sore throat, not certainly of syphilitic nature; has lost most of his hair, following an attack of typhoid fever eight years since; has had no skin disorders and has no present evidence of syphilis; is married and has two healthy children, and of late years has been a steady man. Late in October he consulted Dr. Mitchell, having suffered for several weeks with pain over the left eye. He said that he had often had headaches, but that this was a new pain and was nearer the skin. The supra-orbital nerve was found tender at its exit, and the pain seemed to run upward in its track; digestion good; heart normal as well as the lungs, and the teeth were sound. The pain came on daily about 10 to 11 A.M., and grew worse up to bed time, causing unilateral flushes in the evening. The disorder seemed to be a quotidian neuralgia, but after six treatments with galvanism Dr. M. found that each of them either augmented the pain at once, or within a short time. This rarely occurs, and when it does, should lead us to suspect the existence of some organic cause of trouble. About this time Mr. L. ceased his visits. November 19. He came back in a condition which explained the probable cause of his disease.

The pain was as severe and was still so acute at night as to prevent his sleeping. The type had changed, the supra-orbital nerve was still tender, but the pain in its track had ceased, and in place of it there was a dull deep ache in the left temple and at the frontal prominence. The scalp in these regions was tender and at times slightly œdematous; the left lid was partially palsied; the pupil slightly dilated, and the left internal rectus muscle insufficient, causing squint and varying amounts of double vision; the conjunctiva was diffusely but not deeply reddened, and the eye-ground and disk were absolutely normal on both sides and at repeated examinations; hearing, touch, taste, and smell normal; pulse 90°; temperature on three days at 3 P.M., he having walked to my office, 99° F. He was placed on iod. potass. five grs. thrice a day, rising in a week to one ʒ daily.

28th. Pain concentrated on the frontal prominence; pupil smaller; ptosis and squint as before; acuity of vision normal.

Dec. 4. Much worse; pain steady day and night; blisters with morphia $\frac{1}{2}$ gr. dressings daily, and these failing, $\frac{1}{4}$ gr. hypodermic injections, twice a day, with leeches over point of pain on alternate days.

16th. Much the same. There is now a new point of pain over the left outer canthus; all the muscles controlled by the third nerve are now palsied; pupil dilated; eye-ground still normal; ordered mercurial inunction in arm-pit twice a day, and bichloride of mercury $\frac{1}{12}$ gr. thrice a day.

21st. Conjunctiva diffusely congested; eyeball projects slightly; left disk is redder than that of the right side; memory failing; has become emotional and at times cries with the pain which is now higher up above the edge of the hair and only in this one place. For some days the ice-bag (dry-cold) has been used over the seat of pain, but as it has always been unpleasant, and he constantly removes it unless watched, it is discon-

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tinued; urination difficult; bowels constipated; gums slightly sore. The mercurials were laid aside, and at times afterwards resumed so as to keep up the mercurial impression, and about thirty grains of iodide of potassium were given daily. Bromide of potassium seemed to have the effect of increasing his headache.

24th. Very feeble; nocturnal fever; the temperature usually 100° F., A.M., and rising to 101°, to 103° at night; slight nausea at times; is now in bed all the time and too weak to stand: the eye remains as before; about this time he began to have more distinctly a slight œdema of the left frontal region. From this time he failed steadily; the mind wandered although he had brief but perfectly lucid intervals, and then the pain was less, a day or two later he became violently delirious, and had one short and slight attack of spasmodic movement in the right arm and hand, after which he fell into a comatose state and died quietly, January 11th.

The examination was limited to the head, as I was not allowed to open the other cavities.

Autopsy.—Dura mater thickened and velvety appearance of inner surface observed; pia mater slightly opaque, with well marked œdema and underlying effusion, and considerable venous congestion, together with small patches of lymph on upper surface of pia mater; meningitis on supra-orbital plate (left) and to a slight extent along left side of longitudinal sinus; none at the base. On removing the brain a small body the size of a pea, of reddish-brown colour and firm consistency, was found attached to the dura mater immediately behind and to the left of the left posterior clinoid process, and just above the cavernous sinus, touching but making no pressure upon the internal carotid artery. The track of the left third nerve was apparently directly under the tumour.

Both middle fossæ of skull were roughened with many spiculæ of bone and the upper surface of basilar process was carious.

On removing the fundus of left eye the optic nerve was seen to be cupped, but no choking of the disk was observed.

Microscopical Examination of the Disk.—The optic disk with a surrounding portion of the tunics of the ball and one inch of the optic nerve were immediately placed in Müller's fluid and hardened; sections were then made, tinted with logwood and examined after being mounted in balsam. There is no swelling of the disk; no increase of the number of vessels, and no other pathological change. In the horizontal cuts through the disk, the retinal fibres part slightly in advance of the cribriform fascia, and pass to the right and left, having at the margin of the disk, and as far as they can be seen, the normal appearance. With a high power the nerve behind, at, and in advance of the cribriform fascia presents normal appearances; there is no increase of the neuclei; no evidence of hyperplasia of the neuroglia, and no degeneration of the axis-cylinders.

Remarks.—On closer study after its removal, Dr. Bertolet found that the tumour must have grown beneath the nerve, which, as it increased, became spread out upon its upper aspect. The growth was a psammoma, the angiolithic sarcoma of Ranvier, and has been described by Dr. Bertolet in the Proc. of the Phil. Path. Soc.

This case seems remarkable for various reasons. It was no doubt syphilitic, judging from the history, the exostoses, and the basal caries, but I am not aware that the "sand tumour" is especially related to this constitutional vice. I suspected the presence of a large growth in the anterior left cerebral lobes, causing inflammation on the third and fifth nerves, and causing pain by involving certain of the meningeal branches of the fifth nerve on their passage, the pain being referred to their terminal distribution. Such I believe to be a common cause of meningitic pains remote from the region directly disturbed. In fact there was meningitis, here and there, and a small tumour, mischievous to one nerve only. Considering the condition of the bones, it is surprising there was so little inflammation or effusion, yet there had been enough of mischief to kill, but absolutely no swelling of the disk up to three days before death.

CASE 6.—J. Q. L., a merchant, æt. 56, resident in a neighbouring city, married, and the father of five healthy children. Although of gay habits in early life, he does not know that he ever had any specific malady, such as syphilis, while at no time has he been a hard drinker. Of late years he chewed and smoked tobacco, but not to excess. He has had no causes of anxiety; is in easy circumstances, and of unblemished blood. Has at times an obstinate mucous discharge from the nose and throat. In 1869, he had at times a little vertigo, without nausea. In 1870 these lessened, and he began to have pain on the top and back of the head behind the right mastoid process, at first intermittent, recurring in the evenings, but absent for many days, and then present every day for a week or more. In Dec. of 1870 and Jan. of 1871, the pain became more severe and more constant, and at length terrible, behind the ear, especially at night, when the torture grew so excessive that he lost all control of himself and wept like a child. The neuralgia was confined to the left occipital region and ran up on to the scalp, but troubled none of the anterior branches of the fifth nerve. With it, when most grave, there was a symptom which marked the height of the attack, and which Dr. Mitchell thus far has seen only in cases of specific neural pain. On the scalp, at the upper limit of the painful region, arose swellings of the skin about two inches in circumference, and at least a quarter of an inch in height. They were red and excessively tender. During January, 1871, he began to sleep badly, remaining awake sometimes for two or three nights; while his memory failed rapidly, his power of thinking became enfeebled, his countenance assumed an imbecile appearance, and he became as emotional as an hysterical girl. Meanwhile the pain grew worse, and early in February he began to have twitching of the *left* thumb and of the interosseal muscles. Very soon they attacked the arm and forearm also, and then extended to the face, after which the attacks returning daily, or many times a day, affected his consciousness, and always beginning in the thumb ended in a bilateral fit, with foaming at the mouth, tongue-biting, and subsequent coma. On recovering, he usually saw double, or had subjective ocular delusions as to the furniture being in motion, a kind of protracted giddiness. I saw him in many of the lighter attacks, which in April and May took the place of the graver fits. There was one most interesting fact. During the fit the muscles of the outer ear moved during the convulsion, and on inquiry I learned that he had the power to move the ear at will. Even the muscles of the tragus and anti-tragus could be seen to twitch. In April, and when I saw him in May, the left hand was liable to constant twitches, but there were then no severe fits.

Dr. Mitchell saw him first on May 20th, and made these notes of his hapless condition. He was in bed moaning with the nearly steady pain of his neuralgia; his mind and memory were quite useless, and he wept at the least cause for emotion. He slept ill or not at all, and had daily attacks of a convulsive nature, rarely to loss of consciousness, and usually on the left side and in the left face. He had incomplete left hemiplegia, and could not walk at all; there was no loss of sensation nor nausea, and no heart disease. Pulse ranged from 90 to 100 in the morning, and 110 to 120 at night, with slight fever and nocturnal rise of thermometer; 99 in the morning, 101 at night; no albumen in urine; bowels constipated.

This seemed to me indeed a hopeless case, although, if it were of specific origin, as I suspected it to be, there was still a chance of relief.

24th. He began to take twenty grains of bromide of lithium thrice a day. A blister was put behind the right ear and kept open. On the second night he slept five hours, and still longer next day.

28th. Continuing the bromide he took $\frac{1}{16}$th of a grain of corrosive sublimate in pill after each meal, and iodide of potassium in rising doses, which in a week reached to $1\frac{1}{2}$ ℥ a day.

The progress was thenceforward amazing; the fits ceased; the palsy lessened day by day; the pain left him; memory and power to reason came back; he slept well and steadily, and ate eagerly.

A summer in the mountains aided him greatly, and in November, 1871, he could walk a mile, the foot dragging a little. The hand still twitched a little, especially when he was excited; and the flexors of the arm had become somewhat contracted, so that, owing to weakness and this cause, he had but little use of the hand. A long galvanic treatment of the shortened muscles, with Faradism of their opponents, failed, as it does usually, to relieve this trouble, nor was a course of *massage* of any greater value.

Ceased to use the iodide in January, 1872; but twice having ventured to lay aside the bromide, he was forced to return to it by the occurrence of a unilateral convulsion. He is now well, save for the permanent partial loss of muscular power in his arm. He takes steadily forty grains of bromide of sodium daily.

Remarks.—I have little doubt as to the specific nature of this case—in fact what may be called the therapeutic diagnosis would be almost conclusive. Yet save for a slight roughness of skin and the persistent mucous discharges—sometimes offensive—there was no symptom to support this belief, no bone or skin troubles at any date; yet this is just what we see many times in syphilitic neuroses, which seem most apt to occur in persons who have had no cutaneous or other evidence of constitutional disease. The unilateral spasms without unconsciousness by degrees assuming the common type of epilepsy also agreed with the habits of a specific disorder of the brain.

I wish also to call attention to the curious swellings like urticaria, which followed the attacks of pain; these also, according to my experience, are seen only in cases of pain in the head, probably due to local meningitis and of specific origin.

I have never before noticed the convulsive movements in the muscles of the auricle and in those attached to the ear, but possibly this may be more common than I supposed it to be. Since making this observation I have discovered that even the intrinsic auricular muscles of the tragus and antitragus may, in many persons, and even in the aged, be called into action by induced or galvanic currents, which makes it probable that they have some distinct functional use and are habitually in action, since otherwise it seems hardly conceivable that they could retain their mobility. I presume that in this case there was a syphilitic growth in the postero-lateral brain region with a local meningitis, the extent of which does not admit of exact definition.

The eye symptoms are described by Dr. Thomson, who saw the case in consultation.

On June 7, a careful ophthalmoscopic examination of both eyes was made. Acuity of vision of each eye was unimpaired, and with the glass which corrected his optical defects he was able with either eye to read $1\frac{1}{2}$ Snellen. Both pupils were then fully dilated and the accommodation paralyzed with atropia. With the mirror the refraction was determined to be hypermetropic $\frac{1}{20}$ at the region of the macula. The media were transparent, and each retina was perfectly normal in appearance. The disks both presented the characteristic signs described by Mr. Allbutt as ischæmia papillæ or "choked disk," and the chromo-lithograph given as the frontispiece of his volume on the "Use of the Ophthalmoscope in Diseases of the Nervous System," might have been made from the case now under consideration, so faithfully does it represent the appearances. Each papilla projected into the vitreous humour so that its highest portion could be seen with a $+\frac{1}{7}$, showing by a calculation of the difference between the refraction of the fundus and the apex of the disk, an elevation of the latter of about 1 m.m. The diameter of the swollen papilla was more than twice that of a normal disk and its edges were ill defined. The arteries were smaller than usual, but the veins were greatly dilated, very tortuous, and here and there hidden from view in the swelling, at the margin of which they seemed to fall from the view of the observer armed with $+\frac{1}{7}$ and became very indistinct, to reappear again perfect in definition with $+\frac{1}{20}$ on the other portions of the fundus.

This gentleman had been almost abandoned as a hopeless case of softening of the brain following apoplexy, but the mirror dissipated this idea, since clinical experience shows that choked disk seldom or never results from hemorrhage, or acute or chronic softening of the cerebral substance, whilst by its aid also a theory of the disease was formed which led to the use of therapeutic measures which were followed by brilliant results.

On July 22, the eyes were again examined, and with $+\frac{1}{20}$, which corrected his hypermetropia, his acuity of vision was $\frac{1}{1}$; there was no swelling or appearance of exudation about either disk; the outlines of the papillæ were distinct; the color was pink; there was no evidence of any atrophic change, and the bloodvessels had resumed their normal appearances.

It would manifestly be impossible in this paper to do full justice to all the observers who have written on the connection between intra-ocular changes and the diseases of the brain, and the reader is referred especially to the valuable work of Mr. Allbutt, *On the Use of the Ophthalmoscope in Diseases of the Nervous System;* to the valuable contributions of Mr. Hughlings

Jackson, and to an interesting and well-illustrated paper by Pagenstecher in the Royal London Ophthalmic Hospital Reports, for November, 1871, for a full discussion of the subject. It has been practically established however, that the condition now known as "choked disk" may become, as in Case 1, the chief if not the only symptom by which a serious brain lesion may be recognized by the examination of the fundus of the eye; that this form of neuritis may exist without the slightest impairment of vision, and that the ophthalmoscope becomes of imperative use in treating nervous diseases, and should be employed in the examination of all cases as a part of the routine, as advised by Mr. Hughlings Jackson, "whether the patient complains of any defect of sight or not."

That this apparently rude lesion of the optic nerve should exist for months, perhaps, and pass off under appropriate treatment without causing any loss of visual power, as in Case 6, led to the belief that a mechanical cause, and not a true local inflammation of the disk, would be found to account for the swollen and congested condition of the papilla; and this view was the one propounded by Von Græfe in a classical paper published in 1866, in which he maintains that any increase of intra-cranial pressure retards the circulation in the cavernous sinus, then in the ophthalmic vein, and finally in the central vein of the retina, which, passing with the optic nerve through the dense and unyielding sclerotic ring, is there compressed and in part strangulated, and that aided by the "multiplying action of this ring," the obstruction to the return of the venous blood is able to induce the œdematous and swollen condition of the papillæ. A second theory, based likewise upon the increased pressure within the cranium, has been advanced by Schmidt, who believes that fluid is forced from the arachnoid cavity along the inter-vaginal space of the optic nerve, and into the canal system of the lamina cribrosa, and there gives rise to the swelling and congestion. Benedict gives yet another explanation, and ascribes the swelling to a morbid innervation of the vaso-motor system of nerves, which causes a hyperæmia with changes in the nerve-fibres of the disk and retina, induced by the reflex irritation of a morbid process anywhere in the brain.

Against the last theory may be adduced the clinical facts set forth in Case 5, where the symptoms previous to death would indicate a high degree of irritation, evinced by severe pain and violent delirium, and where the autopsy revealed rude changes of the membranes and caries of the basilar process, but where the disks retained their normal appearances both before and after death, and presented, even under microscopic examination, no signs of disease. So far as the truth of Schmidt's views are concerned, other competent observers have failed to convince themselves of the existence of the system of canals in the lamina cribrosa, although a dilatation of the inter-vaginal space has been frequently described; whilst the idea of Græfe is made doubtful by the study of the anatomy of the veins, which proves, according to Sesemann, that the anastomoses between the ophthalmic vein and the facial are so abundant that no great retardation of blood could result from pressure upon the cavernous sinus, so long as the facial veins are patent. In spite of this objection it would appear from a study of the cases here presented, that an inflammation more particularly of the meninges about the base of the brain, whether increasing the intracranial tension or not, is competent to produce an engorged condition of the optic papilla which becomes a most valuable diagnostic sign of lesion of the brain, whilst vision may for an indefinite time remain perfect; but that a true neuritis may ensue, indicated in the specimens described, by an increase of the bloodvessels, and a hyperplasia of the connective tissue of the nerve, which would eventuate in time in atrophic changes with partial if not entire loss of sight, accompanied by a shrunken and pallid condition of the disk when examined by the mirror, and by marked cicatricial changes under the microscope after the death of the patient.

For the ophthalmic surgeon this condition of choked disk has assumed a practical aspect, since no less an authority than Dr. Wecker has proposed for its relief to incise the sheath of the optic nerve with an instrument which he exhibited and described to the members of the International Ophthalmological Congress in London, in August, 1872; and in the eighth volume of the Reports of Saint Bartholomew's Hospital, will be found a history of a case of optic neuritis treated after this manner by Mr. Henry Power, in which the improvement was so slight as to enable the patient to distinguish day-light only, whilst no change whatever in the appearance of the disk could be observed by the ophthalmoscope after the operation: the futility of this might be safely predicted from an examination of the specimens above described, since under the tinting with logwood, they appear to present evidences of overgrowth of the connective tissue throughout the entire nerve-trunks, from the papilla to the optic commissure, and to illustrate the following description by Rindfleisch:—

> "Non-inflammatory differs from inflammatory hyperplasia of connective tissue by its slower rate of progress. A hyperæmic dilatation of the vessels is the starting point of the morbid process. This is associated with an emigration of white corpuscles, causing an increase of bulk and a thickness of the connective tissue; the sheaths of vessels being often from three to five times their normal thickness. These cells are transformed into fibrillar tissue in the course of time, and the process is so similar to inflammation that no fault could be found with those who consider this as chronic inflammation."

In conclusion I would call attention to the value of the determination of the extent of the swelling into the vitreous humour, which can readily be done by observing with what convex glass the highest point of the papilla can be distinctly seen by the ophthalmoscope, used with the erect image. A simple calculation enables one to know how many parts of a millimetre the apex of the swelling projects beyond the fundus, and permits one, in watching the progress of the case, to note any advance or retrogression of the swelling that may occur during the treatment.